Income Group Differences in Relationships Among Survey Measures of Physical and Mental Health

by Shawn A. Johnston and John E. Ware Jr.

The present research tested the hypothesis that the experience of health is hierarchically organized such that gratification of physical health needs must precede gratification of mental health needs. It was reasoned that because the nondisadvantaged possess greater resources for the gratification of health needs in general, symptoms of mental illness would be more salient for this group and thus better able to explain variance in both mental and physical illness. On the other hand, it was reasoned that symptoms of physical illness would be more salient and thus better able to explain variance in both mental and physical illness for the disadvantaged. Results of the study indicate income group differences in patterns of relationships among health variables, supporting the hypothesis and suggesting important differences in the validity of health measures across income groups. The results are related to previous findings in medical sociology, and suggestions for future research are made.

Considerable evidence exists documenting the differential prevalence of both mental and physical illnesses across social classes; in general, both types of illness tend to be more prevalent among those of lower socioeconomic status [1–5]. In addition to experiencing poorer physical health, persons of lower socioeconomic status are more concerned about the possibility of contracting physically debilitating diseases [6], view themselves as more susceptible to illness in general [7], and tend to value physical health more highly and mental health less highly than do the economically nondisadvantaged [8]. The work of some investigators [9–11] suggests that a person's sensitivity and response to symptoms may be affected by sociocultural factors, such as ethnic background.

If socioeconomic status affects both the recognition of illness symptoms and the relative salience of physical vs. mental illnesses, socioeconomic status would also be expected to affect *behavior* in response to illness. The work of

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Zola [9], which suggests that a person's interpretation of a given symptom and the type of medical care he/she subsequently seeks varies for different cultural groups, is consistent with this expectation.

Taken together, these findings of a positive relationship between health status and socioeconomic status and of different illness behaviors in different cultural groups suggest several crucial questions in relation to the interpretation of differences in health status as measured using indexes based either on dysfunction or on general health perceptions. For example, to what extent is illness behavior in general a function of socioeconomic class? Does behavior in response to recognized symptoms of *mental* illness differ from behavior in response to recognized symptoms of *physical* illness as a function of socioeconomic status?

Maslow's concept of a "need hierarchy" [12] (that gratification of one basic need is followed by domination of consciousness by another need higher in the hierarchy) seemed applicable to the formulation of hypotheses in this area. By extension of Maslow's concepts we formulated the hypothesis that, at least for a generally healthy population, the experience of health is hierarchically organized such that physical health needs must be gratified before mental health needs. Because the economically nondisadvantaged have greater resources available to apply to gratification of health needs in general, symptoms related to physical illness should be less salient for this group than for the disadvantaged. Thus we predicted that symptoms of physical illness would be relatively better able to explain variance in both physical and mental illness for the disadvantaged than for the nondisadvantaged. We also predicted that symptoms of physical illness would account for more of the variance in mental and physical illness for the disadvantaged than would symptoms of mental illness. Conversely, we expected that symptoms of mental illness would be more salient for the nondisadvantaged and thus better able to explain variance in both mental and physical illness for this group.

The hypotheses outlined here also suggested comparable relationships between socioeconomic status and other more global measures of mental and physical health. For example, we expected that the nondisadvantaged would be more likely than the disadvantaged to have a larger mental than physical health component in their general health perceptions. Conversely, we expected that symptoms of physical illness would carry proportionately more weight in explaining the general health perceptions of disadvantaged groups.

Methodology

Sampling and Data Gathering

In the summer and fall of 1974, data were gathered on all members of 2,506 families residing in a sample of households in Dayton, Ohio. Dayton is one of four sites included in the Health Insurance Study (HIS) that Rand Corporation is conducting for DHEW [13]. During the fall and winter of 1974, 646 families chosen to be representative of the 2,506 families [14] were offered

enrollment in the HIS and 593 accepted. The HIS enrollee sample differed intentionally from the Dayton population in several respects: heads of households were restricted to age 59 and younger, low-income families ($9,000 and below) were oversampled, the upper range for family income was truncated at $27,000 (in 1973 dollars), and persons in institutions and in the military were excluded.

Data were gathered using a self-administered medical history questionnaire that included items relating to physical and emotional symptoms, functional limitations, health perceptions, health habits, and satisfaction with the quality of life. All heads of households and all other household members 18 and over were asked to fill out questionnaires for themselves; all other responses were done by proxy. Interviewer assistance was provided when needed.

For purposes of the current study, analyses were restricted to data on 823 enrollees 14 years of age and older (a representative sample of persons in that age group from the 593 families enrolled). Age of respondents ranged from 14 to 75 years; average age was 34.6. Forty-eight percent of the respondents were males, and 52 percent were females. Approximately 12 percent were nonwhite. Average number of school years completed was 12.6. Reported annual family income (in 1973 dollars) ranged from $0 to $27,000, with an average of $13,687.

Income Groups

The sample was divided into four mutually exclusive groups on the basis of reported annual family income: $6,000 or less ($n = 122$), $6,001 to $12,000 ($n = 212$), $12,001 to $18,000 ($n = 262$), and $18,001 and over ($n = 227$). The groups were defined to be sufficiently large so that the subjects-to-variables ratio was at least 10:1 for all regression analyses.

Variables Used in the Analyses

Symptoms were conceptualized as specific concomitants of mental or physical illness, and illness behavior was conceptualized as the response of the person to symptoms. However, certain symptom-illness-symptom cycles throw open to question the causal directionality of the relationship between symptoms and illnesses as herein defined. Recognizing this situation and not wishing to imply causality, we have termed the sets of variables used in the analyses "explanatory" and "target" variables rather than independent and dependent variables.

Explanatory Variables: Symptoms. Explanatory variables were divided into two groups on the basis of the component of health primarily defined—physical or mental—and were operationalized as scores from 12 scales constructed from the medical history questionnaire. Assignment of these variables to the two groups was supported by factor analysis of correlations among scale scores [15].

The first group of six scales contained items pertaining to observable physical limitations and abilities and were used to measure symptoms of physical illness. Three of these scales were constructed, from items used by

Hulka and Cassel [16], according to the method of summated ratings [17] and pertained to performance of minimal, light, and moderate tasks requiring physical abilities (e.g., moving light furniture, participation in sports). The abilities scales contained three or four items each, and internal-consistency reliabilities ranged from 0.86 to 0.90. The remaining three scales pertained to chronic functional limitations (due to poor health) in mobility, physical activities, and social activities (e.g., trouble in walking, limitation in amount of work) [18]. The functional limitations scales were evaluated according to the criteria of scalogram analysis [19] and defined three or four scale types each; reproducibility coefficients ranged from 0.90 to 0.98.

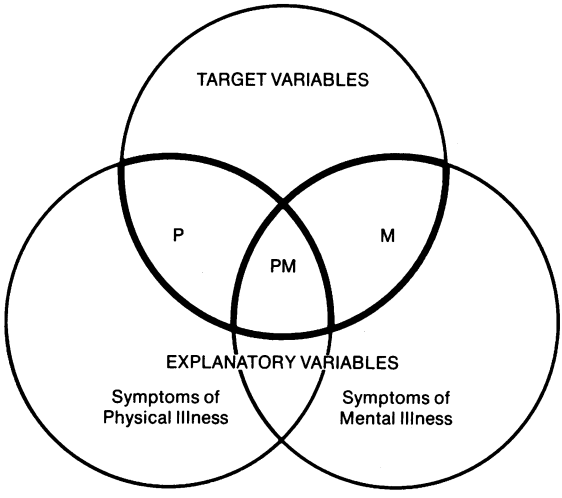
The second group of six scales, constructed from items used by Dupuy [20], pertained to psychiatric symptoms and mood fluctuations (anxiety, agitation, depression, emotional stability, life satisfaction, and love life) and were used to measure symptoms of mental illness. The mental illness symptom scales were constructed according to the method of summated ratings after factor analytic verification [21] of hypothesized item groupings [15]. These scales contained from two to six items each; internal-consistency reliability coefficients ranged from 0.61 to 0.89.

Target Variables: Responses to Symptoms. The target variables, i.e., the variables explained in the current study, pertained to responses to symptoms. Four variables were used: (1) bed days, the reported number of days each respondent stayed in bed because of poor health during the prior three months; (2) recognition of severe emotional problems, a single-item measure of the extent to which the respondent perceived severe problems (personal, emotional, behavioral, or mental) during the prior year; (3) general health perceptions, a seven-item summated ratings scale to measure general health (internal-consistency reliability of 0.88); and (4) quality of life, a three-item summated ratings scale containing items like those used by Cantril [22] (internal consistency reliability of 0.75).

Analysis Plan

Differences in Means. One-way analysis of variance was used to test the hypothesis that means for all explanatory and target variables were equal for all income groups. Chance probabilities of less than 0.05 for a type I error were considered significant. These analyses of mean differences constituted a partial replication of previous studies of income group differences in the prevalence of symptoms of physical and mental illness and were useful in interpreting the results of regression analyses.

Multiple Regression: The Full Model. Regression models were calculated to estimate the amount of overlap between explanatory and target variables as defined in the figure on p. 420 and to gain a better understanding of the nature of this overlap. The full model consisted of the regression of one target variable at a time on all 12 explanatory variables, i.e., the area defined by P + M + PM in the figure. The full model was computed to test the hypothesis that there was no relationship between a given target variable and the 12



Overlap between symptom and target variables.

explanatory variables in a given income group. Sixteen full models were computed, one for each of the four target variables in each of the four income groups.

Multiple Regression: Physical and Mental Illness Symptom Models. The physical and mental illness symptom models consisted of the regression of one target variable at a time on the six variables relating to physical illness and the six variables relating to mental illness, respectively. Physical illness symptom models yielded estimates of the area defined by P + PM in the figure above, and mental illness symptom models estimated the area defined by M + PM. These models were computed to test the hypothesis that there was no relationship between a given target variable and a given group of variables relating to physical or mental illness in a given income group. Thirty-two models were computed, one for each of four target variables in each of four income groups, for the variables relating to physical illness (16 models) and for the variables relating to mental illness (16 models).

Relative Incremental Validity. Overlap was observed between variables relating to physical illness, variables relating to mental illness, and each target variable (the area defined by PM in the figure above). It was therefore necessary to compute the increment in variance explained by each group of explanatory variables to achieve a clearer picture of its validity in relation to a given target variable. In other words, if the area defined by PM were significant, both the physical and the mental illness symptom models would have appeared to have significant explanatory power although only one or neither of them might have had unique explanatory power. To take this into account, incremental validity coefficients [23] were estimated for each group of symp-

toms through the use of stepwise regression of the target variables on the two groups of explanatory variables. The incremental validity of the variables relating to physical illness (area P in the figure on p. 420) was estimated by computing the increment in R^2 when the variables relating to physical illness were added to the regression after the variables relating to mental illness. (Note that the confounded variance, area PM in the figure on p. 420, is not included in this incremental R^2.) The R^2 resulting from inclusion of the variables relating to symptoms of mental illness during the first step of the regression served to estimate the area defined by M + PM. Thus the incremental validity of the physical illness symptom model was defined as the R^2 for the full model (P + M + PM) minus the R^2 for the mental illness symptom model (M + PM). The same method was applied to estimate the incremental validity of the mental illness symptom model (area M in the figure on p. 420).

Incremental validity coefficients as described above may vary across income groups because of group differences in full model R^2 values. In order to compare R^2 values across income groups, as required to evaluate the health hier- R^2 (relative incremental validity coefficient) for each incremental validity coefficients in terms of corresponding full model R^2 values. A standardized R^2 (relative incremental validity coefficient) for each incremental validity model was computed by dividing the incremental R^2 by the full model R^2 for that income group.

From the health hierarchy hypothesis, specific patterns of relationships in relative incremental validity coefficients across income groups were expected. If relative incremental R^2 values and income groups are ranked from high to low, a perfect positive correlation would be expected between ranks for mental illness symptom models and income groups. Conversely, a perfect negative correlation would be expected between ranks for physical illness symptom models and income groups. The chance probability of such a relationship in four pairs of ranks (one-tailed test) is 0.05 according to Ferguson [24].

Results

Income Group Differences in Health Variables

Results of comparisons of mean scores for income groups on explanatory and target variables are summarized in Table 1. Differences among group means were significant in 11 of the 16 comparisons involving all explanatory and target variables. Consistent with published findings, lower income groups tended to have less favorable mental and physical illness scores.

Explanatory Power of Regression Models

In all instances the full model was valid; the 12 physical and mental illness variables together explained a significant amount of the variance in all target variables for all income groups. Variables relating to physical illness explained a significant amount of the variance in bed days and general health perceptions

Table 1. Means and Standard Deviations (in parentheses) of Scores on Explanatory and Target Variables, by Income Group, and F Ratios for Significance of Differences Among Groups

Variable	Income group					F ratio*
	All (N = 823)	Under $6,001 (N = 122)	$6,001–12,000 (N = 212)	$12,001–18,000 (N = 262)	Over $18,000 (N = 227)	
EXPLANATORY VARIABLES						
Anxiety	9.9 (3.9)	10.3 (4.0)	10.1 (4.2)	9.6 (3.9)	9.6 (3.6)	1.3
Depression	13.7 (5.0)	15.0 (5.5)	14.4 (5.2)	12.9 (4.4)	13.5 (4.9)	6.5‡
Stability†	10.2 (1.8)	9.8 (1.9)	10.1 (1.9)	10.4 (1.7)	10.3 (1.8)	3.6§
Love life†	9.0 (2.5)	8.2 (2.7)	8.9 (2.6)	9.3 (2.2)	9.2 (2.5)	5.7‡
Agitation	8.5 (3.4)	8.6 (3.2)	9.1 (3.8)	8.3 (3.3)	8.2 (3.2)	3.1§
Life enjoyment†	18.1 (4.4)	16.7 (4.7)	17.6 (4.7)	18.8 (3.9)	18.4 (4.2)	8.4‡
Minimal activities limitations	9.0 (0.3)	9.0 (0.5)	9.0 (0.3)	9.0 (0.4)	9.0 (0.1)	<1
Light activities limitations	8.9 (0.6)	8.8 (0.7)	8.9 (0.6)	8.9 (0.6)	8.9 (0.5)	<1
Moderate activities limitations	11.6 (1.4)	11.3 (1.8)	11.7 (1.3)	11.6 (1.4)	11.7 (1.3)	2.5
Physical activities limitations	0.1 (0.4)	0.2 (0.5)	0.2 (0.5)	0.1 (0.4)	0.1 (0.3)	4.7‡
Role activities limitations	0.1 (0.5)	0.3 (0.7)	0.2 (0.5)	0.1 (0.4)	0.1 (0.4)	4.6‡
Mobility limitations	0.6 (0.2)	0.1 (0.4)	0.0 (0.2)	0.0 (0.3)	0.0 (0.1)	1.7
TARGET VARIABLES						
Bed days	0.6 (2.5)	0.9 (3.7)	0.5 (2.0)	0.5 (2.3)	0.6 (2.4)	<1
Recognition of severe emotional problems	1.9 (0.7)	2.1 (0.7)	1.9 (0.7)	1.8 (0.7)	1.8 (0.7)	5.2‡
General health perceptions†	29.2 (5.0)	28.0 (5.8)	28.6 (5.2)	29.7 (4.7)	29.6 (4.6)	4.7‡
Quality of life rating†	25.7 (4.1)	24.6 (4.3)	25.0 (4.5)	26.2 (3.7)	26.2 (4.0)	7.1‡

* For all tests, degrees of freedom = 3 plus 822.

† A high score on these scales defines a positive health state; for all other scales a high score defines a negative health state.

§ $p < 0.05$.

‡ $p < 0.01$.

Table 2. Summary of R^2 Values for Regression Models: Days in Bed

Income group	Full model (P + M + PM) *	Mental illness symptom model (M + PM)*	Physical illness symptom model (P + PM)*	Relative incremental validity	
				Mental illness symptom model	Physical illness symptom model
Under $6,001	0.90	0.15	0.89	0.01	0.83
$6,001–12,000	0.20	0.04	0.16	0.20	0.80
$12,001–18,000	0.53	0.18	0.48	0.09	0.66
Over $18,000	0.28	0.11	0.22	0.21	0.61

* Letter designations refer to areas in figure on p. 420.

for all income groups and a significant amount of the variance in quality of life ratings for the two highest income groups (but not for the two lowest). The variables relating to physical illness did not explain a significant amount of the variance in recognition of severe emotional problems for any of the four income groups. The variables relating to mental illness explained a significant amount of the variance in all target variables for all income groups, with the exception of bed days for the two lowest income groups. (F ratios are available from the authors on request.)

Relative Incremental Validity Models

Regression findings regarding relative incremental validity models are best viewed in the context of all regression results. R^2 values are presented in Tables 2–5; these tables summarize validity findings for bed days, recognition of severe emotional problems, general health perceptions, and quality of life, respectively. In addition to the R^2 values for the validity models described in the preceding section, Tables 2–5 also contain R^2 values for all income groups for the relative incremental validity of the mental and physical illness symptom models.

Bed Days. The relative incremental validity of mental illness symptom variables in relation to bed days generally increased with increases in income, and the relative incremental validity of physical illness symptom variables in relation to bed days decreased with increases in income (Table 2). For physical illness symptom variables, the pattern corresponds perfectly to that expected from the health hierarchy hypothesis. Relative incremental R^2 values ranged from a low of 0.61 for the highest income group to a high of 0.83 for the lowest income group. In other words, the overlap between bed days and the variables relating to symptoms of physical illness (area P in the figure on p. 420) decreased as income increased. Consistent with the health hierarchy hypothesis, a nearly opposite pattern was observed for variables relating to symptoms of mental illness. Relative incremental R^2 values ranged from a low of 0.01 for the lowest income group to a high of 0.21 for the highest income group. Only

Table 3. Summary of R^2 Values for Regression Models: Recognition of Severe Emotional Problems

Income group	Full model (P + M + PM)*	Mental illness symptom model (M + PM)*	Physical illness symptom model (P + PM)*	Relative incremental validity	
				Mental illness symptom model	Physical illness symptom model
Under $6,001	0.34	0.32	0.05	0.85	0.06
$6,001–12,000	0.46	0.45	0.05	0.89	0.02
$12,001–18,000	0.41	0.39	0.03	0.93	0.03
Over $18,000	0.50	0.49	0.03	0.94	0.02

* Letter designations refer to areas in figure on p. 420.

one anomalous result was observed in this pattern, for the second lowest income group. It should be noted that the bed days variable correlated more strongly with the physical illness symptom variables than with the mental illness symptom variables in all income groups.

Recognition of Severe Emotional Problems. Table 3 indicates strong support for the health hierarchy hypothesis vis-à-vis recognition of severe emotional problems. The relative incremental validity of the mental illness symptom variables in relation to this target variable increased with increases in income, from 0.85 for the lowest income group to 0.94 for the highest income group. Relative incremental validity R^2 values for physical illness symptom variables in relation to recognition of severe emotional problems were much smaller and conformed almost exactly to expectations; only one minor anomalous result was observed. Recognition of severe emotional problems clearly correlated more strongly with the mental illness symptom variables than with the physical illness symptom variables in all income groups.

General Health Perceptions. A large amount of variance overlap was observed between general health perceptions and both physical and mental illness

Table 4. Summary of R^2 Values for Regression Models: General Health Perceptions

Income group	Full model (P + M + PM)*	Mental illness symptom model (M + PM)*	Physical illness symptom model (P + PM)*	Relative incremental validity	
				Mental illness symptom model	Physical illness symptom model
Under $6,001	0.59	0.15	0.52	0.12	0.74
$6,001–12,000	0.49	0.28	0.35	0.28	0.43
$12,001–18,000	0.59	0.36	0.41	0.30	0.39
Over $18,000	0.62	0.35	0.40	0.35	0.44

* Letter designations refer to areas in figure on p. 420.

Table 5. Summary of R^2 Values for Regression Models: Quality of Life Ratings

Income group	Full model (P + M + PM)*	Mental illness symptom model (M + PM)*	Physical illness symptom model (P + PM)*	Relative incremental validity	
				Mental illness symptom model	Physical illness symptom model
Under $6,001	0.39	0.34	0.10	0.74	0.13
$6,001–12,000	0.46	0.45	0.06	0.87	0.02
$12,001–18,000	0.53	0.46	0.12	0.77	0.13
Over $18,000	0.62	0.54	0.17	0.72	0.13

* Letter designations refer to areas in figure on p. 420.

symptom variables (areas P and M respectively). Relative incremental validity R^2 values ranged from 0.12 to 0.35 for mental illness symptom variables and increased consistently from low to high income groups (Table 4). Relative incremental R^2 values for physical illness symptom variables were comparable for the three highest income groups, ranging from 0.39 to 0.44. Consistent with the health hierarchy hypothesis, the overlap between physical illness symptom variables and general health perceptions was greatest ($R^2 = 0.74$) for the lowest income group. The pattern of overlap between physical and mental illness symptom variables and general health perceptions followed that predicted from the health hierarchy hypothesis. General health perceptions correlated with both the physical and mental illness symptom variables; the overlap between general health perceptions and mental illness symptom variables increased with increases in income, and the overlap between general health perceptions and physical illness symptom variables tended to decrease with increases in income.

Quality of Life. Overlap between mental illness symptom variables and the quality of life ratings (area M in the figure on p. 420) was much greater than the overlap between quality of life ratings and the physical illness symptom variables. However, no trend in income group differences in overlap with quality of life ratings was apparent for either mental or physical symptoms (see Table 5). It should be noted, however, that while the results of the relative incremental validity models did not conform to expectations for the quality of life variable, an examination of all other regression models revealed increases in R^2 values for both physical and mental illness symptom variables with increases in income for this variable.

Discussion

Support for Health Hierarchy Hypothesis

Study findings provide considerable support for the health hierarchy hypothesis. Symptoms related to both physical and mental illness correlated

significantly with the four target variables (bed days, recognition of severe emotional problems, general health perceptions, and quality of life ratings) even when the overlap between mental illness and physical illness symptoms was removed. These findings suggest that either or both sets of symptoms may explain illness behavior and ratings of health and quality of life for all income groups. The four income groups also differed considerably in correlations among symptoms of mental and physical illness and the four target variables. In the lowest income group, three of the four target variables were always explained best by symptoms of physical illness and worst by symptoms of mental illness. In contrast, among the higher income groups, these target variables were always explained best by symptoms of mental illness and worst by symptoms of physical illness. In general, the pattern of differences across four income groups corresponded to that hypothesized, although the differences among the three higher income groups were not as marked as the difference between the lowest income group and the other three groups.

It is especially significant that the measure of general health perceptions conformed so consistently to expectation. Since general perceptions of health would be expected to reflect the contribution of both mental and physical health components, the results for this variable offer particularly strong support for the health hierarchy hypothesis.

Whereas the general health perceptions variable was expected to pose a critical test for the health hierarchy hypothesis, the quality of life variable was expected to pose the least meaningful test. The quality of a person's life is influenced by such a plethora of factors that it may have been an unfair test of the health hierarchy hypothesis. Income group differences predicted by the health hierarchy hypothesis in the relationship between mental and physical illness symptoms and quality of life ratings were not observed. For all income groups, a very large amount of the variance in quality of life ratings was explained by symptoms of mental illness, whereas a much smaller amount was explained by symptoms of physical illness. Trends in the physical and mental illness symptom models and the incremental validity versions of these models indicated increasing importance of both mental and physical illness symptom variables in relation to quality of life. This is consistent with the health hierarchy hypothesis for mental illness symptom variables but contradictory for physical illness symptom variables. Contrary to the health hierarchy hypothesis, these results suggest that health as defined by mental and physical phenomena increases in importance in relation to quality of life with increases in income. However, as noted earlier, these trends were not apparent in the relative incremental validity models and should be studied further before conclusions are drawn. The relationship between quality of life ratings and symptoms of mental illness may have been overestimated in the current study due to similarity of the methods employed in their measurement. Further research employing multiple methods of measurement [25] is necessary to obtain a clearer picture of the relationship between these measures.

Although the theoretical framework outlined here may not be the only

explanation of income group differences in the interrelationships among symptoms and target variables, the results certainly suggest that such relationships do differ for different income groups. They also indicate that the validity of survey measures (i.e., how they should be used and interpreted) of health differs as a function of socioeconomic status. The results of the current study suggest that the health values of different groups may be related, not only to differential prevalence of disease, but also to income group differences in illness behavior in response to or with the same symptoms.

It is important to note that most of the respondents were generally healthy. It is not clear to what extent the health hierarchy hypothesis would be applicable to an unhealthy population. It is, however, reasonable to assume that, as an example, if a person from one of the higher income groups were to lose a leg or an arm, physical problems would immediately increase in salience for that person. How this would subsequently affect that person's interpretation of other health problems or symptoms, and whether the interpretation would conform to the health hierarchy hypothesis, are questions for further research.

Alternative Hypotheses

Although the data appear to offer support for the main hypothesis of this research, alternative explanations must necessarily be considered. The most plausible rival hypotheses are the following: (1) differential prevalence in health problems across income groups; (2) differential score variance for mental and physical illness symptoms across income groups; and/or (3) differential reliability of health measures across income groups. Any one of these three rival hypotheses might explain the pattern of results; each one, however, is open to refutation.

First, the greater prevalence of symptoms of mental and physical illness as an alternate explanation is not supported because the disadvantaged experience more of both types of symptoms. As an alternative hypothesis, it would only be compelling if the disadvantaged suffered only a greater number of physical health symptoms.

Second, when variances in scores for the symptoms across income groups were examined, it was clear that they were relatively comparable. Thus the second rival hypothesis does not explain the pattern of results.

Third, a test of the hypothesis that differential relationships among the health measures derived from differential reliability of the measures across income groups was performed. Consistent with this hypothesis, some measures tended to be less reliable for the disadvantaged. Effects of these differences on relationships among health measures were tested by correcting correlations among symptom and response variables for attenuation due to differences in reliability. These corrections were performed for two middle-income groups prior to regression analyses. The results (available from the authors) did not support the third explanation.

It should be noted that the results, which support the health hierarchy hypothesis, could have been an artifact of the use of linear statistical models. We tested the possibility that the differential relationships across income groups may have resulted, in part, from income group differences in the curvilinearity of the relationships among explanatory and target variables; no such differences in relationships were observed.

Implications of Study Results

The results of this research have some intriguing implications for the interpretation and use of survey measures of mental and physical health. If, as our data indicate, symptoms of physical illness are relatively better predictors of recognition of severe emotional problems for the disadvantaged than the nondisadvantaged, does this then imply that for the disadvantaged these problems are relatively more of a "physical" disorder? The data indicate that the mental illness component of bed days was much greater for the nondisadvantaged than for the disadvantaged. Does this suggest that bed days may result more from mental problems than physical problems for the nondisadvantaged?

Findings regarding income group differences in relationships among measures commonly used to define health status have important implications for further research. These differences must be taken into account in interpretation of findings from any studies of health and illness behavior. Whether the differences are large enough to warrant consideration in policymaking by health planners and evaluators is unclear and should be further investigated.

In a recent paper, Mechanic [26] called for attributional analyses of health and illness behavior. Our data suggest directions in which such attributional analyses might go. Answers are needed for questions such as: How does a person perceive the causes of his/her illness? How does a person recognize and act on symptoms? How does the person know that he/she is healthy or ill? How does he/she know how to respond to an illness episode? How does he/she know how to seek care for a given problem? What behaviors does he/she believe will result in the speediest cure? Some of these issues are being addressed in the Health Insurance Study, in which a comprehensive set of health measures are being obtained for a large number of respondents over a period of three to five years [13].

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